

Table of Contents

Executive Summary	v
Background.....	v
Purpose and Scope.....	vi
Conclusions	viii
Valued Ecosystem Component Approach:.....	viii
Salinity Criteria	viii
Salinity and Freshwater Inflow.....	ix
Resource Based Evaluation of the Recovery Strategy:	x
Recommendations	x
Section 1 -- Introduction.....	1
Importance of Fresh Water to Estuaries.....	1
Basis for Minimum Flows and Levels	1
MFLs for the Caloosahatchee River and Estuary	2
Development of Initial MFL Criteria.....	2
Other Resource Protection Tools.....	4
Recovery and Prevention Strategy.....	4
History and Major Features of the Caloosahatchee River and Estuary	5
Approach Used to Establish the Caloosahatchee MFL	6
Definition of the Resource that Needs to be Protected.....	8
Conditions Required for Resource Protection	8
Review of the Caloosahatchee MFL Rule	10
Section 2. -- Effects of Minimum Flows on Other Organisms	13
Oysters.....	13
Phytoplankton	17
Zooplankton and Ichthyoplankton.....	19
Section 3 -- The Salinity Tolerance of <i>Vallisneria americana</i>	23
Section 4 -- Freshwater Inflow and Salinity in the Caloosahatchee Estuary.....	29
Introduction	29
Relationship Between Inflows and Salinity	30
Present and Future Discharge at S-79	32
Inflow from the Tidal Basin	33
Estuarine Hydrodynamic Model.....	35
Freshwater Inflow and Salinity.....	37
Partitioning Total Flow	37
Evaluation of MFL Salinity Criteria:	41
Summary.....	43
Section 5 -- Resource Based Evaluation of the Recovery Strategy	45
Section 6 -- Conclusions.....	51
Conclusions	51
Salinity Criteria	51
Salinity and Freshwater Inflow:.....	52
Resource Based Evaluation of the Recovery Strategy:	53
Recommendations	53
Section 7 - Literature Cited.....	55

List of Tables

Table 2-1 . Summary of relationships between various groups of organisms and freshwater discharge at S-79.	22
Table 4-1. Frequency Distribution of Total Estuary Inflows (see also Figure 4-7).	38
Table 4-2. Evaluating watershed inflows when S-79 monthly flows are near 300 cfs (275 to 325 cfs)	39
Table 4-3. Predicted salinity at the Ft. Myers Yacht Basin (see Figure 4.2) for the '1995 Base' and '2020 Restudy' scenarios.	43
Table 5-1. Frequency analysis of predicted salinity at Site 1, Bird Island and Site 2. Percentages represent the fraction of days in the 31-year period of record when the daily average or moving average salinity was in a particular range.	46

List of Figures

Figure ES-1. Location of the Caloosahatchee River, including major features, natural distribution of submerged aquatic vegetation and related sampling sites.	vii
Figure 2-1. Location of oyster sampling sites in the Caloosahatchee River (Cattle Dock, Piney Point), San Carlos Bay (Bird Is., Kitchel Key) and Tarpon Bay	14
Figure 2.2. Mean <i>P. marinus</i> prevalence (\pm SE) during winter months in oysters from Piney Point (PP), Cattle Dock (CD), Bird Island (BI), Kitchel Key (KK), and Tarpon Bay (TB) in Caloosahatchee River.	15
Figure 2-4. Chlorophyll a in the southern Charlotte Harbor system (0 km at S-79, 60 km in Pine Island Sound).	18
Figure 2-5. Location of sampling stations relative to locations of seagrasses within the Caloosahatchee Estuary.	19
Figure 2-6. Effect of freshwater inflow at S-79 on net collected zooplankton density, sampled monthly at six downstream stations.	21
Figure 3-1 Distribution of <i>Vallisneria americana</i> and <i>Halodule wrightii</i> in the Caloosahatchee Estuary..	23
Figure 3-2 Net exponential growth rates ($r \pm 95\%$ C.I.) of <i>Vallisneria americana</i> measured in laboratory mesocosms during constant exposure to different salinities.	25
Figure 3-3. Shoot density of <i>Vallisneria americana</i> at monitoring stations 1, 2, 3 and 4 as a function of salinity on the day of collection..	26
Figure 3-4. Number of shoots at monitoring Station 1 in the upper Caloosahatchee Estuary from January 1998 – September 2002.	28
Figure 4-1. Daily average salinity at the Ft. Myers surface salinity sensor as a function of the 30-day average discharge at S-79..	30
Figure 4-2. Caloosahatchee Watershed showing the Tidal Basin that drains into the estuary west of S-79 and the S-79 Watershed that drains to the estuary through S-79.	31
Figure 4-4. Bathymetry of the Caloosahatchee Estuary and location of monitoring stations..	35
Figure 4-6. Results of Hydrodynamic Model. Salinity as a Function of Total Freshwater Inflow to the Caloosahatchee Estuary.	38
Figure 4-7. Distribution of Average Monthly Caloosahatchee Estuary Inflows – 1965 to 1995	39
Figure 4-8. Percentage of Average Monthly Caloosahatchee Estuary Inflows contributed by Upper Basins.	40
Figure 4-9. Salinity at Ft. Myers Yacht Basin and Exceedance limits for the Caloosahatchee Minimum Flow and Level..	42

List of Figures (Cont.)

Figure 4-10. Results of the 31-year ‘1995 Base’ and ‘2020 with Restudy’ simulations of estuarine salinity.	43
Figure 5-1. Predicted daily average salinity at <i>Vallisneria</i> Monitoring Site 1, Bird Island.	46
Figure 5.2. Predicted daily average salinity at <i>Vallisneria</i> Monitoring Site 2.	46
Figure 5-3. 30-day moving averaged salinity at Bird Island	47
Figure 5-4. 30-day moving average salinity at Site 2.	47
Figure 5-5. Simulated performance of <i>Vallisneria americana</i> at Site 1 under the ‘1995 Base’ and ‘2020 with Restudy’ scenarios.	48
Figure 5-6. Simulated performance of <i>Vallisneria americana</i> at Site 2 under the ‘1995 Base’ and ‘2020 with Restudy’ scenarios.	48